Additional notes on the distribution of Saturniidae in Paraguay (Lepidoptera: Saturniidae)

Luigi RACHELI

Luigi RACHELI, Via Fara Sabina 1, I-00199 Rome, Italy

Abstract: Distributional notes on the Saturniids of Paraguay are reported. *Eacles imperialis tucumana* ROTHSCHILD, 1907, *Cicia citrina* (SCHAUS, 1904) and *Psilopygida (Psilopygida) crispula* (DOGNIN, 1905) are reported for the first time, and *Citheronia vogleri* (WEYENBERGH, 1881) is confirmed for Paraguay. Some observations on the faunistic relationships of the Cordillera de Yvytyrusu are given.

Ergänzende Angaben zum Vorkommen von Saturniiden in Paraguay (Lepidoptera: Saturniidae)

Zusammenfassung: Es werden Anmerkungen zum Vorkommen von Saturniiden in Paraguay gemacht, *Eacles imperialis tucumana* ROTHSCHILD 1907, *Cicia citrina* (SCHAUS 1904) und *Psilopygida (Psilopygida) crispula* (DOGNIN 1905) werden zum ersten Mal aus Paraguay gemeldet; das Vorkommen von *Citheronia vogleri* (WEYENBERGH 1881) dort wird bestätigt. Weiterhin werden Anmerkungen über die faunistischen Beziehungen der Cordillera de Yvytyrusu gegeben.

Note supplementari sulla distribuzione dei Saturnidi in Paraguay (Lepidoptera: Saturniidae)

Riassunto: Vengono riportati alcuni dati sulla distribuzione dei Saturnidi in Paraguay. *Eacles imperialis tucumana* ROTHSCHILD, 1907, *Cicia citrina* (SCHAUS, 1904) e *Psilopygida (Psilopygida) crispula* (DOGNIN, 1905) vengono riportate per la prima volta mentre *Citheronia vogleri* (WEYENBERGH, 1881) viene confermata per il Paraguay. Inoltre vengono apportate alcune osservazioni sui Saturnidi della Cordillera de Yvytyrusu.

Introduction

The Saturniidae of Paraguay, approximately 74–78 species, are very scarcely known. In fact, a total of 14 species was recently reported for the first time for Paraguay by DRECHSEL (1995) and RACHELI (1995 b).

Some studies were made by SCHADE (1925, 1927, 1928) while LEMAIRE (1971, 1973, 1974, 1978, 1980, 1988), in his systematic monographs on

neotropical Saturniidae, has reported several new records on the distribution of this familiy in Paraguay. A faunistic study on the saturniids of the Cordillera de Ÿvytyrusu was recently made by DRECHSEL (1995) with a discussion on the disjunct distribution of some species recorded for this area.

RACHELI (1995 b) reported some new distributional data on the Saturniidae in Paraguay, while DRECHSEL & LAMPE (1996) described the preimaginal instars of *Neorcarnegia basirei* (SCHAUS, 1892) from Paraguay with a discussion of the distribution of the species. Three additional species are reported in the present paper, as well as hypotheses on the faunistic relationships of the Paraguayan Saturniidae. All specimens reported upon in the present paper were collected by Ulf DRECHSEL and are in the author's collection.

List of species

Dysdaemonia fosteri ROTHSCHILD, 1906

1 ♂, Dep. Guaira, Tacuarita, 13. I. 1994.

Distribution: This species is known from Bolivia, Argentina and Paraguay.

Remarks: It is a species with a typical disjunct distribution known from northeastern Argentina and southeastern Bolivia with an extension into eastern Paraguay. In Paraguay it was reported for Villarica, San Berhardino, Cerro Acatì and Sapucay (SCHADE 1925, LEMAIRE 1980, DRECHSEL 1995, RACHELI 1995 b).

Eacles imperialis tucumana ROTHSCHILD, 1907

1 ♂, Dep. Boqueròn, Nueva Asuncion, 12. I. 1996.

Distribution: Species distributed in Argentina and Bolivia. Reported for the first time for Paraguay. This subspecies is an endemic of the Chaco region.

Citheronia vogleri (WEYENBERGH, 1881)

1 ♂, Dep. Boqueròn, 150 km N Filadelfia, 8. V. 1995; 1 ♀, Dep. Boqueròn, Transchaco Hwy., km 430, 19.-28. IV. 1995; 1 ♂, Dep. Boqueròn, Nueva Asuncion, 12. I. 1996.

Distribution: It is distributed in Argentina, Bolivia, Uruguay, Paraguay and Brazil. Its presence in Paraguay is confirmed for the first time since DRUCE (1890).

Cicia citrina (SCHAUS, 1904)

3 ♂♂, Dep. Paraguari, Sapucay, 4.-8. II. 1995.

Distribution: This species was known from Brazil and Bolivia, and it is reported here for the first time for Paraguay.

Giacomellia bilineata (BURMEISTER, 1878)

2 ♂♂, Dep. Presidente Hayes, Laguna Escalante, 7. x. 1995.

Distribution: The species is known from Argentina and Bolivia. Recently it was reported by LAMPE (1995) for Paraguay, who described two further species of the genus *Giacomellia* from Paraguay.

Psilopygida (Psilopygida) crispula (DOGNIN, 1905)

1 ♂, Dep. Boqueròn, Transchaco Hwy., km 430, 19.-28. IV. 1995.

Distribution: This species was known from Bolivia, Brazil and Argentina, it is reported here for the first time for Paraguay.

Adeloneivaia sabulosa sabulosa (ROTHSCHILD, 1907)

1 ♀, Dep. Caazapa, 10 km NNW Taval, 15.-20. x. 1995.

Distribution: This species is distributed in Argentina, Bolivia, Paraguay and Brazil.

Adeloneivaia fallax (BOISDUVAL, 1872)

2 ♂♂, Dep. Caazapa, 10 km NNW Taval, 15.-20. x. 1995.

Distribution: This species was considered to be an endemic of SE Brazil by LEMAIRE (1988), but it was reported by DRECHSEL (1995) also for Paraguay.

Adelowalkeria flavosignata (WALKER, 1865)

1 ♂, Dep. Guaira, Cerro Acatì, 750 m, 18. XI. 1993.

Distribution: A widely distributed species, reported for Venezuela, Brazil, Argentina, Bolivia, Peru and Paraguay.

Adelowalkeria tristygma (BOISDUVAL, 1872)

1 ♂, Dep. Guaira, Cerro Acatì, 750 m, 18. XI. 1993.

Distribution: A species distributed in Brazil and Paraguay.

Oiticella convergens (HERRICH-SCHÄFFER, 1855)

2 ♂♂, Dep. Caazapa, 10 km NNW Taval, 15.-20. X. 1995.

Distribution: A species distributed in Brazil, Venezuela and Paraguay.

Automeris basalis (WALKER, 1855)

2 ♂♂, Dep. Guiara, Cerro Acatì, 750 m, 16. IX. 1993.

Distribution: Species known from SE Brazil and Paraguay.

Leucanella aspera aspera (C. & R. FELDER, 1874)

1 ♂, Dep. Boqueròn, 150 km N Filadelfia, 9. V. 1995; 1 ♂, Dep. Boqueròn, Transchaco Hwy., km 430, 19.-28. IV. 1995.

Distribution: This species is known from Uruguay, Argentina and Paraguay.

Copaxa flavina flavina DRAUDT, 1929

1 ♀, Dep. Guaira, Calle Florida, 15. IV. 1994.

Distribution: The nominative subspecies is known from Brazil, Argentina and Paraguay.

Remarks: Both the yellow and the reddish-brown form are found in Paraguay. The female reported above belongs to the yellow form.

Discussion

The word "refuge" encompasses forested areas of different sizes, in which species and ecosystems persisted during the climatic changes of the Pleistocene, and which may thus be characterized by the presence of a variable number of endemic taxa.

The "refuge theory", based on various assumptions and hypotheses, has been used to explain the high biotic diversification of the neotropical realm (HAFFER 1969, 1974, 1978, 1985, MÜLLER 1972, PRANCE 1973). The distribution of Heliconiini and Ithomiinae (Lepidoptera, Nymphalidae)

led BROWN (1975, 1977 a, 1977 b, 1979, 1982, 1987) to propose 38 to 44 "subspecies-endemic centers", which fit well with the distribution patterns of other Lepidoptera. These areas may correspond to "refuges" estimated by a geoscientific model (considering paleoclimate, geomorphology and soils, see TYLER et al. 1994: 192).

As reported above, DRECHSEL (1995) carried out a faunistic study on the Saturniidae of the Cordillera de Yvytyrusu. His study reports on an incomplete list of the species of this area, which is considered a refuge for the presence of six species known only from SE Brazil, and for one species distributed in northern Argentina and Bolivia. He suggested that the disjunct distribution of these seven species, of a total of 35 reported for this area, is probably due to the climate changes in South America during the ice ages.

An apparently disjunct distribution is shown by various species of neotropical Saturniidae, for instance *Paradaemonia andensis* (ROTHSCHILD, 1907), *Paradaemonia ruschii* MAY & OITICICA, 1943 and *Paradaemonia gravis* (JORDAN, 1922) (see LEMAIRE 1980, RACHELI 1995 a). However, the distribution of most species of Neotropical Saturniidae is still poorly known.

The presence in the Cordillera de Yvytyrusu of these seven species could be related to the geographic position of this Cordillera, situated between two ecologically and zoogeographically distinct areas like those of SE Brazil and NE Argentina. In fact, the area including the Cordillera de Yvytyrusu and Rio Paraná was considered by BROWN et al. (1995) as the borderline of two different faunal regions named, respectively, Chaco and South Temperate (= SE Brazil), this latter considered as a subunit of the Atlantic region. The area of the Cordillera de Yvytyrusu was also considered to have a high probability for palecological stability (BROWN 1979), almost continuous with the larger Iguazú "refuge". This area may, therefore, be considered transitional with some SE Brazilian elements mixed with Argentinian-Bolivian species. If it was indeed a "refuge", as supposed by DRECHSEL (1995), it should show endemic elements different from the taxa in both areas.

At present, I suppose that it is premature to argue in favour of the refuge theory using examples of the Saturniidae, due to the very poor knowledge of their distribution patterns in the Neotropic region.

Acknowledgements

I am grateful to Wolfgang A. NÄSSIG for editing and for the translation into German of the abstract. My appreciation to Dr. Keith S. BROWN jr. and Dr. Christoph HÄUSER for helpful critics and information. Many thanks also to Ulf DRECHSEL for useful information and to Roberto VINCIGUERRA who let me examine specimens from Paraguay.

References

BROWN, K. S. jr. (1975): Geographical patterns of evolution in Neotropical Lepidoptera. Systematic and derivation of known and new Heliconiini (Nymphalidae: Nymphalinae). – J. Entomol. (B) **44**: 201-242.

—— (1977a): Geographical patterns of evolution in Neotropical forest Lepidoptera (Nymphalidae: Ithomiinae and Nymphalinae – Heliconiini). – In: DESCIMON, H. (ed.), Biogéographie et evolution en Amérique tropicale. – Publ. Lab. Zool. Ec. Norm., **Sup. 9**: 118-160.

—— (1977b): Centros de evolução, refùgios quaternàrios e conservação de patrimônios genéticos na região neotropical: padroes de diferenciação em Ithomiinae (Lepidoptera: Nymphalidae). – Acta Amazonica **7**: 75-137.

—— (1979): Ecologia geografica e evolução nas florestas neotropicais. – Campinas (Universidad Estadual de Campinas), XXXI + 265 + 120 pp.

—— (1982): Paleoecology and regional patterns of evolution in Neotropical forest butterflies. – Pp. 255-308 *in:* PRANCE, G. T. (ed.), Biological diversification in the Tropics. – New York (Colombia Univ. Press).

—— (1987): Biogeography and evolution of neotropical butterflies. – Pp. 66-104 *in:* WHITMORE, T. C., & PRANCE, G. T. (eds.), Biogeography and quaternary history in tropical America. – Oxford (Clarendon).

——, KLITZKE, C. F., BERLINGERI, C., & EUZÉBIO RUBBO DOS SANTOS, P. (1995): Neotropical swallowtails: chemistry of food plant relationships, population ecology, and biosystematic. – Pp. 405-445 in: SCRIBER, J. M., TSUBAKI, Y., & LEDERHOUSE, R. C. (eds.), Swallowtails Butterflies: their ecology & evolutionary biology. – Gainesville, Florida (Scientific Publ.), VIII + 459 pp.

DRECHSEL, U. (1995): Die Cordillera del Yvytyrusu in Paraguay, ein Refugialraum für mehrere disjunkt verbreitete Saturniiden-Arten (Lepidoptera: Saturniidae). – Entomol. Z. **105** (14): 269-278.

——, & LAMPE, R. E. J. (1996): Die Präimaginalstadien von *Neorcarnegia basirei* (SCHAUS 1892) mit Anmerkungen zur Biogeographie (Lepidoptera: Saturniidae, Ceratocampinae). – Nachr. entomol. Ver. Apollo, Frankfurt am Main, N.F. **17** (2): 143-152.

DRUCE, H. (1890): Descriptions of new species of Lepidoptera Heterocera from Central and South America. – Proc. Zool. Soc. London **1890**: 493-520.

HAFFER, J. (1969): Speciation in Amazonian forest birds. – Science **165**: 131-137.

—— (1974): Avian speciation in tropical South America. – Publ. Nuttal Ornithol. Club **14**: 1-390.

—— (1978): Distribution of Amazon forest birds. – Bonn. Zool. Beitr. **29**: 38-79.

—— (1985): Avian zoogeography of the neotropical lowlands. – Ornithol. Monogr. **36**: 113-146.

LAMPE, R. E. J. (1995): *Giacomellia drechseli* n. sp. und *Giacomellia escobari* n. sp., zwei neue Saturniidae aus Paraguay (Lepidoptera). – Entomol. Z. **105** (23): 457-461.

LEMAIRE, C. (1971): Révision du genre *Automeris* HÜBNER et des genres voisins. Biogéographie, éthologie, morphologie, taxonomie (Lep. Attacidae). – Mém. Mus. natl. Hist. nat. (N.S.), sér. A, Zool., **68**: 1-232, figs. 1-132, pls. 1-32.

—— (1973): Révision du genre *Automeris* HÜBNER et des genres voisins. Biogéographie, éthologie, morphologie, taxonomie (Lep. Attacidae) (suite). – Mém. Mus. natl. Hist. nat. (N.S.), sér. A, Zool., **79**: 233-422, figs. 133-278, pls. 30-49.

—— (1974): Révision du genre *Automeris* HÜBNER et des genres voisins. Biogéographie, éthologie, morphologie, taxonomie (Lep. Attacidae) (suite et fin). – Mém. Mus. natl. Hist. nat. (N.S.), sér. A, Zool., **92**: 423-576, figs. 279-370, pls. 50-61.

—— (1978): Les Attacidae americans. The Attacidae of America (= Saturniidae). Attacinae. – Neuilly-sur-Seine (the author), 238 pp., 49 pls.

—— (1980): Les Attacidae americains. The Attacidae of America (= Saturniidae). Arsenurinae. – Neuilly-sur-Seine (the author), 199 pp., 76 pls.

—— (1988): Les Saturniidae americains. The Saturniidae of America. Los Saturniidae americanos (= Attacidae). Ceratocampinae. – San José (Museo Nacional de Costa Rica), 480 pp., 64 pls.

MÜLLER, P. (1972): Centres of dispersal and evolution in the Neotropical region. – Stud. neotrop. Fauna **7**: 173-185.

PRANCE, G. T. (1973): Phytogeographic support for the theory of Pleistocene forest refuges in the Amazon basin, based on evidence distribution patterns in Caryocaraceae, Chrysobalanaceae, Dichapetalaceae and Lecythidaceae. – Acta Amazonica **3**: 5-38.

RACHELI, L. (1995a): A new subspecies of *Paradaemonia terrena* from Peru (Lepidoptera, Saturniidae, Arsenurinae). – Fragm. entomol., Roma, **26** (2): 249-252.

—— (1995b): Note sui saturnidi del Paraguay e descrizione della femmina di *Scolesa hypoxantha* ROTHSCHILD (Lepidoptera, Saturniidae). – Fragm. entomol., Roma, **27** (1): 145-154.

SCHADE, F. (1925): Entomologische Skizzen aus Paraguay. I. Saturniden [sic]. – Entomol. Rdsch. **42**: 32-35.

—— (1927): Entomologische Skizzen aus Paraguay. II. Ceratocampyden [sic]. – Entomol. Rdsch. **44** (1): 4.

—— (1928): Die Kolonie Independentia als Sammelgebiet. – Entomol. Rdsch. **45** (2): 6.

TYLER, H., BROWN, K. S. jr., & WILSON, K. (1994): Swallowtail butterflies of the Americas. A study in biological dynamics, ecological diversity, biosystematics, and conservation. – Gainesville, Florida (Scientific Publ.), 376 pp., 100 pls.

Received: 11. VII. 1996

© Entomologischer Verein Apollo e. V., Frankfurt am Main, Mai 1997 ISSN 0723-9912